

CLAIMS

1. A rotational phase difference detecting system  
(15) for detecting a rotational phase difference between  
5 a plurality of rotating bodies, comprising:
  - a first rotating body (13) with a first mark  
(12);
    - a second rotating body (11) with a second mark  
(10);
      - 10 a mark sensor (4) for detecting said first mark;  
a first camera (2) for imaging said second mark  
when said mark sensor detects said first mark; and  
a display section (7) for displaying said second  
mark imaged by said first camera;
      - 15 wherein a rotational phase difference between  
said first and second rotating bodies is detected from  
a position of an image of said second mark displayed on  
said display section.
  - 20 2. The rotational phase difference detecting  
systems set forth in claim 1, further comprising an optical  
system (1) for restricting an imaging range of said first  
camera (2);  
wherein said first camera images said second  
25 mark (10) through said optical system.
  3. The rotational phase difference detecting

system as set forth in claim 2, further comprising a light-emitting device (3) for emitting light to said second rotating body (11) through said optical system (1);

5 wherein light from said light-emitting device is irradiated to said second rotating body (11) when said mark sensor (4) detects said first mark (12).

4. The rotational phase difference detecting system as set forth in claim 2, further comprising an actuator (30) for driving said first camera (2) and said optical system (1) so that an optical axis of said optical system is approximately normal to a side surface of said second rotating body (11).

15 5. The rotational phase difference detecting system as set forth in claim 1, further comprising an arm (23) which has said first camera (2) and said mark sensor (4) mounted on one end thereof and a predetermined weight (24) mounted on the other end;

20 wherein said arm is mounted on a vibration removing table (21) mounted on columns through an elastic body (25).

25 6. The rotational phase difference detecting system as set forth in claim 1, further comprising a second camera (42) for imaging a third mark (40) provided on said first rotating body (13) when said mark sensor (4) detects

said first mark (12);

wherein said display section (7) displays an image of said third mark imaged by said second camera.

5 7. A rotational phase difference detecting method of detecting a rotational phase difference between a plurality of rotating bodies, comprising the steps of:

detecting a first mark (12) provided on a first rotating body (13);

10 imaging and displaying a second mark (10) provided on a second rotating body (11), when said first mark is detected; and

detecting a rotational phase difference between said first and second rotating bodies from a position of 15 an image of said second mark.

8. The rotational phase difference detecting method as set forth in claim 7, further comprising the steps of:

20 imaging and displaying a third mark (40) provided on said first rotating body (13), when said first mark (12) is detected; and

detecting a position of an image of said second mark with an image of said third mark as reference.

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9. A machine operating-state monitoring system, comprising the rotational phase difference detecting

system (15) as set forth in any one of claims 1 through 6, for monitoring an operating state of a machine by employing said rotational phase difference detecting system.

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10. The machine operating-state monitoring system as set forth in claim 9, wherein  
said rotational phase difference detecting system comprises a rotational phase difference calculating section (16) for calculating a rotational phase difference between the first and second rotating bodies (13, 11), and a rotational phase difference deciding section (17) for deciding whether or not the rotational phase difference computed by said rotational phase difference calculating section is a predetermined value or greater; and  
alarm means (19) is provided for output an alarm in response to a signal from said rotational phase difference deciding section.

20. 11. The machine operating-state monitoring system as set forth in claim 9, wherein  
said rotational phase difference detecting system comprises a rotational phase difference calculating section (16) for calculating a rotational phase difference between the first and second rotating bodies (13, 11); and  
said display section (7, 18) displays the

calculated rotational phase difference in a time-series manner.

12. A machine operating-state monitoring system for  
5 monitoring an operating state of a machine provided within  
a factory by a factory-side system (105) and a remote-side  
system (107) connected through a transfer medium (106),  
wherein

10 said factory-side system comprises the  
rotational phase difference detecting system (15) as set  
forth in any one of claims 1 through 6, and alarm means  
(19) for outputting an alarm;

15 said remote-side system comprises a rotational  
phase difference deciding section (109) for deciding  
whether or not a rotational phase difference detected by  
the rotational phase difference detecting system is a  
predetermined value or greater; and

20 when it is decided by said rotational phase  
difference deciding section that said rotational phase  
difference is said predetermined value or greater, said  
remote-side system transmits a signal to said factory-side  
system through said transfer medium, and said alarm means  
(19) outputs an alarm in response to said signal.

25 13. A machine operating-state monitoring system for  
monitoring an operating state of a machine provided within  
a factory by a factory-side system (105) and a remote-side

system (107) connected through a transfer medium (106),  
wherein

- said factory-side system comprises
  - a first rotating body (13) with a
  - 5    first mark (12),
    - a second rotating body (11) with a
    - second mark (10),
      - a mark sensor (4) for detecting said
      - first mark, and
  - 10           a first camera (2) for imaging said
  - second mark when said mark sensor detects said first mark;
  - said factory-side system further comprises
    - alarm means (19) for outputting an alarm;
  - said remote-side system comprises
    - 15           a rotational phase difference
    - calculating section (16) for calculating a rotational
    - phase difference between the first and second rotating
    - bodies, based on information on said second mark imaged
    - by said first camera, and
  - 20           a rotational phase difference
  - deciding section (109) for deciding whether or not the
  - rotational phase difference calculated by said rotational
  - phase difference calculating section is a predetermined
  - value or greater; and
  - 25           when it is decided by said rotational phase
  - difference deciding section that said rotational phase
  - difference is said predetermined value or greater, said

remote-side system transmits a signal to said factory-side system through said transfer medium, and in response to said signal, said alarm means (19) outputs an alarm.

5       14.       A machine operating-state monitoring system for monitoring an operating state of a machine provided within a factory by a factory-side system (105) and a remote-side system (107) connected through a transfer medium (106), wherein

10               said factory-side system comprises  
                                a first rotating body (13) with a  
                                first mark (12),  
                                a second rotating body (11) with a  
                                second mark (10),  
15                a mark sensor (4) for detecting said  
                                first mark, and  
                                a first camera (2) for imaging said  
                                second mark when said mark sensor detects said first mark;  
                                said factory-side system further comprises a  
20               display section (18);  
                      said remote-side system comprises a rotational  
                                phase difference calculating section (16) for calculating  
                                a rotational phase difference between the first and second  
                                rotating bodies, based on information on said second mark  
25               imaged by said first camera; and  
                     the rotational phase difference between the  
                                first and second rotating bodies, calculated by said

rotational phase difference calculating section, is transmitted from said remote-side system to said factory-side system through said transfer medium and is displayed on said display section in a time-series manner.

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15. The machine operating-state monitoring system as set forth in any one of claims 9 through 14, wherein a print with a possibility of printing trouble is extracted by monitoring an operating state of a printing machine; and
- said plurality of rotating bodies are printing rolls (13, 11).

16. A machine operating-state monitoring method of monitoring an operating state of a machine by a rotational phase difference between a plurality of rotating bodies, comprising:
- an imaging step of imaging a second mark (10) provided on a second rotating body (11) by a first camera (2) when a mark sensor (4) detects a first mark (12) provided on a first rotating body (13); and
- a rotational phase difference calculating step of calculating a rotational phase difference between said first and second rotating bodies, based on information on said second mark imaged by said imaging step.
17. The machine operating-state monitoring method

as set forth in claim 16, further comprising:

a rotational phase difference deciding step of  
deciding whether or not said rotational phase difference  
calculated by said rotational phase difference calculating  
5 step is a predetermined value or greater; and

an alarm output step of outputting an alarm when  
it is decided in said rotational phase difference deciding  
step that said rotational phase difference is said  
predetermined value or greater.

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18. The machine operating-state monitoring method  
as set forth in claim 16, further comprising a display  
step of displaying said rotational phase difference  
calculated by said rotational phase difference calculating  
15 step on a display section (18) in a time-series manner.

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19. A machine operating-state monitoring method of  
monitoring an operating state of a machine provided within  
a factory by a factory-side system (105) and a remote-side  
20 system (107) connected through a transfer medium (106),  
said monitoring method comprising the steps of:

detecting a rotational phase difference by the  
rotational phase difference detecting system as set forth  
in any one of claims 1 through 6, provided in said  
25 factory-side system;

transmitting information on the detected  
rotational phase difference from said factory-side system

- to said remote-side system through said transfer medium;  
deciding whether or not said rotational phase  
difference is a predetermined value or greater, based on  
the rotational phase difference information received by  
5 a rotational phase difference deciding section (109)  
provided in said remote-side system;  
transmitting a signal from said remote-side  
system to said factory-side system through said transfer  
medium when said phase difference deciding section decides  
10 that said rotational phase difference is said  
predetermined value or greater; and  
outputting an alarm by alarm means (19) provided  
in said factory-side system when said signal is received.
- 15 20. A machine operating-state monitoring method of  
monitoring an operating state of a machine provided within  
a factory by a factory-side system (105) and a remote-side  
system (107) connected through a transfer medium (106),  
said monitoring method comprising the steps of:  
20 imaging a second mark (10) provided on a second  
rotating body (11) by a first camera (2) provided in said  
factory-side system when a mark sensor (4) provided in  
said factory-side system detects a first mark (12) provided  
on a first rotating body (13);  
25 transmitting information on the imaged second  
mark from said factory-side system to said remote-side  
system through said transfer medium;

- calculating a rotational phase difference between said first and second rotating bodies, based on said second-mark information received by a rotational phase difference calculating section (16) provided in said
- 5      remote-side system;
- deciding whether or not the calculated rotational phase difference is a predetermined value or greater, by a rotational phase difference deciding section (109) provided in said remote-side system;
- 10     transmitting a signal from said remote-side system to said factory-side system through said transfer medium when said phase difference deciding section decides that said rotational phase difference is said predetermined value or greater; and
- 15     outputting an alarm by alarm means (19) provided in said factory-side system when said signal is received.
21.    A machine operating-state monitoring method of monitoring an operating state of a machine provided within a factory by a factory-side system (105) and a remote-side system (107) connected through a transfer medium (106), said monitoring method comprising the steps of:
- imaging a second mark (10) provided on a second rotating body (11) by a first camera (2) provided in said
- 25    factory-side system when a mark sensor (4) provided in said factory-side system detects a first mark (12) provided on a first rotating body (13);

transmitting information on the imaged second mark from said factory-side system to said remote-side system through said transfer medium;

- calculating a rotational phase difference  
5 between said first and second rotating bodies, based on said second-mark information received by a rotational phase difference calculating section (16) provided in said remote-side system;

- transmitting information on the calculated  
10 rotational phase difference from said remote-side system to said factory-side system through said transfer medium; and

- displaying the transmitted information on a  
15 display section (18) provided in said factory-side system in a time-series manner.

22. The machine operating-state monitoring method as set forth in any one of claims 16 through 21, wherein  
a print with a possibility of printing trouble  
20 is extracted by monitoring an operating state of a printing machine; and

said plurality of rotating bodies are printing rolls (13, 11).